General

Guideline Title

Clinical practice guideline for urinary tract infection in children.

Bibliographic Source(s)

Working Group of the Clinical Practice Guidelines for Urinary Tract Infection in Children. Clinical practice guideline for urinary tract infection in children. Madrid (Spain): Ministry of Health National Health Service Quality Plan, Social and Equality Policy, Aragon Health Sciences Institute (I+CS); 2011. 259 p. (SNS Clinical Practice Guidelines: I+CS; no. 2009/01). [372 references]

Guideline Status

This is the current release of the guideline.

Recommendations

Major Recommendations

Levels of evidence (1++ to 4; 1a to 4) and grades of recommendation (A to D, Q, GCP) are defined at the end of the "Major Recommendations" field.

Protection and Risk Factors for Urinary Tract Infection (UTI)

Lack of Hygiene as a Risk Factor for UTI: Using a Nappy and Oxyuriasis

Key Questions

- Does a lack of hygiene when using a nappy affect the incidence of UTI?
- Does a lack of hygiene related to the presence of oxyuriasis affect the incidence of UTI?

GCP - It is recommended to change nappies frequently.

D - It is recommended to rule out pinworm infection in girls with recurrent UTI.

Breastfeeding and Its Protective Role against UTI

Key Question

- Does breastfeeding give any protection against UTI?

C - It is recommended to inform mothers of the benefits and the protective effect of breastfeeding when planning the feeding of their infants.

C - It is recommended to continue breastfeeding for at least 6 months.

Phimosis as a Risk Factor for UTI

Key Question

- Are uncircumcised boys more likely to have UTI?

B - It is recommended to explore and assess the foreskin in all boys with UTI, whether associated with structural abnormalities of the urinary tract or not.

GCP - Circumcision should not be routinely performed even though there is an association between circumcision and reduced risk of UTI.

C - It is recommended to try obtaining retraction of the foreskin by medical treatment in boys or infants with recurrent febrile urinary tract infection, with or without malformations or dysfunctions of the urinary tract associated with phimosis.

B - In those boys or infants with recurrent febrile urinary tract infection, with or without malformations or dysfunctions of the urinary tract associated with phimosis where phimosis persists after medical treatment, it is recommended to perform circumcision.

Clinical Diagnosis of UTI

Key Question

- What is the validity of the clinical findings for diagnosis of UTI in children?

A - Clinical suspicion of UTI in children from the clinical manifestations requires laboratory confirmation, due to its low discriminative ability.

A - In children under 24 months of age with fever without focus it is recommended to take a urine test to rule out UTI.

A - In children over 24 months old, with symptoms of abdominal or back pain, fever, dysuria, frequency or both, or the onset of incontinence it is recommended to take a urine test to confirm UTI.

Biological Diagnosis of UTI

Urine Collection Method

Key Question

- What is the method of choice for urine collection for the diagnosis of UTI?

B - For children who can control urination, a midstream clean catch urine sample is recommended.

C - For children who cannot control urination that require immediate diagnosis and/or treatment, it is recommended to use a collection technique that minimises the risk of contamination (suprapubic aspiration [SPA] or bladder catheterisation). The choice of technique should be subject to the level of training and resources of the health care centre.

C - For children who cannot control urination that do not require immediate diagnosis and/or treatment, use a well performed non-invasive urine collection technique (perineal bag or clean catch).

D - If the analysis of urine collected by a non-sterile technique (perineal bag) is contaminated, it is recommended to confirm it by taking a repeat sample using techniques that minimise the risk of contamination. The choice of technique will depend on the patient's clinical status, level of collection training and healthcare setting resources.

A - It is recommended to use ultrasound, if available, to improve the effectiveness of suprapubic aspiration, when this is chosen.

GCP - It is recommended that patient care points that offer suprapubic aspiration should have ultrasound.

Preserving and Transporting Urine Samples

Key Question

- How should a urine sample be preserved and transported?

C - It is recommended to process urine samples within 4 hours so they are not affected by bacterial growth.

C - If it is not possible to start the urine culture analysis within 4 hours, it is recommended to refrigerate the urine to be used to detect bacteriuria immediately after collection.

C - When refrigeration is not possible and the urine is to be processed between 4 and 24 hours after collection, preservatives may be employed as major delays can lead to bacterial growth.

GCP - It is recommended not to consider the results of some urinary profile parameters (nitrite and glucose) from urine with chemical preservatives added, as they may not be valid.

GCP - When using chemical preservatives, ensure the minimum volume of urine sample recommended by the manufacturer is taken.

Diagnostic Tests in Urine

Key Question

- What is the most valid urine test for diagnosing UTI in children?

B - It is recommended to perform an urgent Gram-stain microscopic examination of urine and urine culture on infants under 3 months with suspected UTI.

B - It is recommended to perform a urine microscopic examination or, failing that, a dipstick test and urine culture on patients with suspected UTI who are younger than 2 years or who cannot control urination. If there is a strong clinical suspicion of UTI or the patient is at risk of severe disease, these tests must be performed urgently.

B - For patients younger than 2 years or who cannot control urination, with suspected UTI, it is recommended to start antibiotic treatment after collecting the urine culture sample if they have bacteriuria or positive nitrites in a reliable urine sample (collected by SPA or catheter).

B - For infants at risk of severe disease (with fever of unknown origin) younger than 2 years or who cannot control urination, it is recommended to start antibiotic treatment after collecting the urine culture sample if they have bacteriuria or positive nitrites or leukocyturia in a reliable urine sample (collected by SPA or catheter).

B - In patients older than 2 years with suspected UTI who can control urination, it is recommended to perform a urine dipstick test. Perform a microscopic examination of urine, if available, only in dubious cases.

B - In patients older than 2 years with a high clinical suspicion of UTI (specific symptoms with the presence of nitrites or bacteriuria, with or without leukocytes), it is recommended to start empirical antibiotic treatment after collecting the urine culture.

B - In patients older than 2 years, with leukocytes only in urine, it is recommended to perform a urine culture, and consider starting antibiotic treatment depending on the likelihood of symptoms and the patient's clinical situation.

B - Do not treat or perform a urine culture on patients older than 2 years if no leukocytes or nitrites are found in the urine sample and clinical features are non-specific.

GCP - It is recommended to confirm UTI by urine culture when available. It is especially necessary in the following cases:

- Children under 2 years or those who cannot control urination
- Where there is suspicion of upper tract UTI
- In any patient at risk of serious illness
- In any patient, when the dipstick results are inconclusive or do not agree with the clinical examination

Localisation of UTI

Key Question

- Is there any clinical finding or laboratory test to locate a suspected or confirmed UTI in children?

GCP - Suspect acute pyelonephritis (APN) in the presence of high fever ≥38.5°C and/or systemic involvement.

C - Suspect APN with high acute phase reactants C-reactive protein (CRP) and/or procalcitonin (PCT), especially the latter.

C - Suspect APN with interleukin-6 (IL-6) in urine >15 pg/mL.

GCP - Suspect APN with a defect in renal concentrating ability, i.e., reduced maximum urine osmolality checked by an appropriate diagnostic test.

B - If there are no symptoms and/or clinical signs (fever, abdominal pain or malaise) with normal or slight increase in acute phase reactants (CRP <20 mg/L, PCT <0.5 ng/mL, erythrocyte sedimentation rate [ESR] <10 mm/h and/or IL-6 in serum <4 pg/mL) or normal spontaneous osmolality, do not suspect renal parenchymal involvement.

GCP - Although analytical studies help in locating UTI, they are not routinely necessary for its management and treatment.

Diagnostic Imaging for UTI

Key Question

- What is the most effective imaging test for the diagnosis of structural abnormalities of the urinary tract and/or kidney damage in children with UTI?

GCP - It is recommended to perform a urinary tract ultrasound after a first UTI if any of the following criteria apply to the patient:

- Febrile UTI
- No control over urination, and with no pre-natal or normal post-natal ultrasound
- Signs of urinary tract dysfunction
- Abdominal or bladder mass
- High creatinine levels
- UTI from a microorganism other than *Escherichia coli*

C - It is recommended to perform an ultrasound of the urinary tract in all children with recurrent UTI.

C - It is recommended to use techniques enhancing the ultrasound of the urinary tract, if available.

D - Do not perform routine renal scintigraphy with technetium-labelled dimercaptosuccinic acid (99mTc-m) (DMSA) in the acute phase for patients with UTI.

GCP - Consider selective use of DMSA in the acute phase, if available, if the result is important for the subsequent diagnosis of the patient (e.g., to decide treatment or complementary tests).

D - It is recommended to perform delayed DMSA scintigraphy (after 6 months) after a first febrile UTI if any of the following criteria apply to the patient:

- Atypical evolution (persistence of fever >48 hours)
- Signs of lower urinary tract dysfunction
- Abdominal or bladder mass
- High creatinine levels
- Septicaemia
- UTI from a microorganism other than *E. coli*
- Pathological findings in previous imaging studies (e.g., ultrasound, cystogram, DMSA)

GCP - Consider delayed DMSA scintigraphy (after 6 months) after a first febrile UTI if clinical, laboratory or radiological findings indicate a high likelihood of renal involvement.

C - It is recommended to perform DMSA scintigraphy on paediatric patients with recurrent febrile UTI.

D - In general, it is not recommended to perform cystography (voiding cystourethrogram [VCUG], radionuclide cystography or echo-enhanced cystography) on children after a first UTI, unless any of the following criteria apply to the patient:

- Recurrent UTI
- Abnormalities in previous imaging studies (ultrasound or DMSA)
- Signs of lower urinary tract dysfunction
- Family history of vesicoureteral reflux (VUR)

C - When performing a cystographic study in paediatric patients, it is recommended to use radionuclide cystography or echo-enhanced cystography, if available, instead of VCUG, unless lower urinary tract abnormalities are suspected.

Predicting the Risk of Chronic Kidney Damage

Key Question

- Are there clinical, radiological or laboratory criteria for predicting the risk of chronic kidney damage after a first febrile UTI?

B - It is recommended to investigate renal injury in paediatric patients with VUR, as they present an increased risk of permanent injury.

B - It is recommended to investigate the presence of permanent renal damage in paediatric patients with recurrent febrile UTI.

B - An increase in acute phase reactants or renal ultrasound during febrile UTI, in isolation, should not be used as predictors of permanent kidney damage.

D - It is not recommended to investigate permanent renal damage by renal scintigraphy in paediatric patients with a first febrile UTI, based on the clinical presentation, delay in establishing treatment, patient's age or gender.

Hospitalisation and Referral Criteria

Hospitalisation Criteria for Suspected UTI

Key Question

- What should be the hospitalisation criteria for children with suspected UTI?

GCP - A child with febrile urinary tract infection meeting any of the following criteria should be admitted to hospital:

- Age less than 3 months old
- Affectation of the general condition, sickly appearance
- Vomiting or oral intolerance
- Dehydration, poor peripheral perfusion
- Urinary system malformations: VUR, obstructive uropathy, renal dysplasia, single kidney
- Poor care or trouble monitoring
- Primary or secondary immunodeficiency
- Electrolyte or renal function abnormalities

GCP - A child with febrile urinary tract infection meeting any of the following criteria may be admitted to hospital, but can also be treated under supervision on an outpatient basis:

- High fever (≥38.5°C) in children of 3–6 months of age
- Persistence of fever after 48 hours of treatment
- Risk factors of an unusual bacteria (recent antibiotic therapy, recent hospitalisation, catheterisation)
- Family history of VUR or prenatal ultrasound with congenital hydronephrosis
- Recurrent febrile urinary tract infections
- Significant increase in acute phase reactants

GCP - In all other cases, outpatient management of the patient is recommended.

Referral to a Specialist

Key Question

- When should a child with UTI be referred from primary care to special care?

GCP - Refer patients from primary care to specialist care if they meet any of the following criteria:

- Febrile urinary tract infection and/or UTI in children under 2 years or in patients who cannot control urination and cannot be completely investigated in primary care
- Recurrent UTIs
- Atypical UTI: fever >48 hours, unusual bacteria
- Structural abnormalities, single kidney and/or nephrourological functional abnormalities
- Permanent kidney damage confirmed by imaging studies or blood markers (urea, creatinine, cystatin C) or urine (proteinuria, maximum urinary osmolality)
- Hypertension

- Failure to thrive
- Family history of nephrourologic disease and/or chronic kidney disease (CKD)
- Anxious family and/or diagnostic confirmation

Treatment of the Acute Phase of UTI

Start of Empirical Treatment

Key Question

- When should antibiotic treatment for suspected febrile UTI start?

GCP - It is recommended to start early antibiotic treatment at the first suspicion of febrile UTI, as delaying the onset of antibiotic therapy in febrile UTI cannot be justified on safety grounds.

Empirical Therapy Administration Route

Key Question

- What is the most appropriate administration route for the antibiotic treatment of febrile UTI in infancy and childhood?

A - Oral administration is the recommended route of choice for antibiotic treatment of children with febrile UTI without known obstructive urological disease and no symptoms of a serious infection.

GCP - Intravenous (IV) antibiotic administration is recommended in children with suspected obstructive uropathy or high-grade VUR (IV–V), signs of septicaemia, uncontrollable vomiting or dehydration.

A - If antibiotic treatment is started intravenously, it is recommended to continue with oral administration when the patient's clinical condition allows it.

GCP - Clinically evaluate the patient after approximately 48 hours of antibiotic treatment by any route of administration.

Choice of Empirical Therapy

Key Question

- What is the most effective empirical antibiotic treatment for febrile UTI (APN) and afebrile UTI?

GCP - The choice of empirical antibiotic treatment for UTI must be based on knowledge of local resistance.

GCP - At present in Spain, for empirical antibiotic treatment of UTI without fever seems appropriate to use amoxicillin-clavulanate, 1st or 2nd generation cephalosporins, fosfomycin, nitrofurantoin or trimethoprim-sulfamethoxazole (TMP-SMX) if the sensitivity information provided by local laboratory permits.

GCP - At present in Spain, for oral (PO) empirical antibiotic treatment of UTI with fever it seems appropriate to use 3rd generation cephalosporins, and as an alternative amoxicillin-clavulanate or 2nd generation cephalosporins (if sensitivity is greater than 80% to 90% for *E. coli*).

GCP - At present in Spain, for IV empirical treatment of UTI with fever it seems appropriate to use 3rd generation cephalosporins IV (cefotaxime, ceftriaxone) or as an alternative an aminoglycoside (gentamicin, tobramycin), amoxicillin-clavulanate IV or 2nd generation cephalosporins IV. Other 3rd generation cephalosporins, such as ceftazidime, and other antibiotics such as amikacin, carbapenems and quinolones should be reserved for special circumstances.

GCP - At present in Spain, for patients younger than 3 months open to the possibility of infection with enterococci, associate ampicillin to the recommended treatment base.

Aminoglycosides and Single Daily Dose Administration

Key Question

- How safe and effective is a daily dose of aminoglycosides when these antibiotics are required in the treatment of UTI?

A - It is recommended to administer aminoglycosides in a single daily dose when required for the treatment of febrile UTI in children.

Duration of Antibiotic Treatment

Key Question

- What is the most effective duration of antibiotic treatment in afebrile and febrile UTI?

A - The recommended antibiotic treatment duration for afebrile UTI/cystitis is 3 to 4 days.

GCP - The recommended antibiotic treatment duration for febrile UTI/APN is a standard duration of 7 to 10 days.

Antibiotic Treatment in Lobar Nephronia and Renal Abscess

Key Question

- What is the treatment of choice and its duration for lobar nephronia (acute focal nephritis) and renal abscess?

GCP - As treatment of choice for acute lobar nephronia (ALN) and renal abscess it is recommended to use 2 antibiotics, chosen according to local sensitivities, initially administered intravenously then orally (PO) after clinical improvement.

D - The recommended antibiotic treatment duration for ALN and renal abscess is 2 to 3 weeks.

Symptomatic Medication in UTI Treatment

Key Question

- Does the use of symptomatic (anti-inflammatory) medication help improve symptoms or prevent kidney damage?

No studies were found of a suitable design, with good methodological quality, or had an appropriate study population or relevant come variables to be able to answer the question posed in this section.

Prophylaxis for UTI

Antibiotic Prophylaxis in Children Shown to Have No Structural or Functional Urinary Tract Abnormalities

Key Question

- Does antibiotic prophylaxis help to prevent further UTI and/or kidney damage in infants and paediatric patients without structural and/or functional abnormalities?

A - Antibiotic prophylaxis should not be routinely given to children who have had a single UTI.

A - Antibiotic prophylaxis should not be given to children with asymptomatic bacteriuria (ABU).

GCP - For children with recurrent UTI, it is recommended to evaluate the use of prophylactic antibiotics individually after appropriate study to rule out structural or functional abnormalities of the urinary tract, and taking into account the existence of resistant strains.

Choice of Antibiotic and Chemoprophylactic Dose

Key Question

- When antibiotic prophylaxis is deemed necessary, what antibiotics and doses should be recommended?

GCP - It is recommended to take into account local resistance patterns when proposing prophylactic treatment, and try to select antibiotics with a narrower spectrum of action to prevent the upper airway bacteria from developing resistance to them.

GCP - Taking into account the above recommendation, it is recommended to use TMP or TMP-SMX in patients older than 2 months of age, and nitrofurantoin in patients older than 2 to 3 years, as the use of prophylactic antibiotics or antiseptics cannot be prioritised due to the lack of available evidence.

GCP - In children under 2 months of age, or in any situation where nitrofurantoin or TMP or TMP-SMX cannot be used, it is recommended to use as prophylactic antibiotic amoxicillin or 1st or 2nd generation cephalosporins.

GCP - Recommended prophylactic doses are as follows:

- Nitrofurantoin: 1–2 mg/kg/day
- TMP-SMX: 2–3 mg/kg/day (of trimethoprim)
- Trimethoprim: 2–3 mg/kg/day
- Any other antibiotic: a third or a quarter of the usual recommended dose

Antibiotic Prophylaxis in Children with Structural and/or Functional Abnormalities

Key Question

- Is the use of prophylactic antibiotics effective in preventing further UTI or renal damage in children with structural and/or functional abnormalities of the urinary tract?

B - It is recommended to use antibiotic prophylaxis in girls with VUR grades III–V for 1 year or until the degree of VUR is re-evaluated by cystographic examination.

GCP - It is recommended to use antibiotic prophylaxis in boys with VUR grades IV–V for 1 year or until the degree of VUR is re-evaluated by cystographic examination.

A - It is not recommended to use antibiotic prophylaxis neither in boys with VUR grades I–III nor in girls with VUR grades I–II.

C - It is recommended to use antibiotic prophylaxis in paediatric patients with dilated urinary tract and suspected obstruction until the diagnosis is confirmed and proper treatment for the obstruction is given.

GCP - It is not recommended to use antibiotic prophylaxis for non-obstructive dilatations of the urinary tract.

Other Preventive Measures: Uropathogenic Strain Vaccines, Ascorbic Acid, Cranberry Juice and Probiotics

Key Question

- Are other measures effective in preventing UTI recurrence: e.g., uropathogenic strain vaccines, ascorbic acid, cranberry juice and probiotics?

GCP - There was insufficient scientific evidence to support a recommendation for the use of any of the following preventive measures: vaccines with uropathogenic strains, ascorbic acid, cranberry juice or probiotics.

Prevention of UTI and Lifestyle Modifications

Key Questions

- Does improving poor voiding habits help prevent UTI recurrence?
- Does improving constipation help prevent UTI recurrence?
- Does increasing fluid intake help prevent UTI recurrence?

C - Preventive measures aimed at reducing recurrences of UTI should be tailored according to the pattern of urinary tract dysfunction or urinary habits of the patient, and directed to achieve adequate fluid intake.

D - It is recommended to investigate and address any constipation in children with UTI and/or signs of lower urinary tract dysfunction to prevent recurrence of UTI.

UTI Prognosis

Risk of UTI Recurrence in Children

Key Question

- What is the risk of recurrent UTI in children with no known structural or functional abnormalities of the urinary tract with a first UTI, and what follow-up is required?

C - Following a first UTI, monitor patients with a normal urinary tract, especially boys under 12 months of age with a non-retractable foreskin, during the first year of evolution, as they have frequent recurrences.

D - Investigate voiding and bowel habits in children with UTI for their possible association with recurrent UTI.

Monitoring UTI in Children

Urine Culture and/or Systematic Urine Analysis

Key Questions

- Should a culture and/or systematic analysis of urine be performed in asymptomatic patients during or after antibiotic UTI treatment?
- Should a culture and/or systematic analysis of urine be performed in asymptomatic patients with structural and/or functional abnormalities?

D - It is not recommended to perform urine culture and/or systematic analysis during antibiotic treatment in children with UTI if the clinical course is favourable.

D - It is not recommended to perform regular culture and/or systematic analyses of urine in asymptomatic children after UTI.

D - It is not recommended to perform regular culture and/or systematic analyses of urine in asymptomatic children with structural and/or functional abnormalities.

Information for Families or Carers to Help in the Diagnosis of UTI

Key Question

- What information should be provided to the families and carers of patients who have had a first UTI?

Q - If UTI is suspected or diagnosed, it is recommended to inform the family, carers or patient (depending on age) about the need for early antibiotic treatment and the importance of completing it.

Q - It is recommended to warn of the possibility of recurrence and advise about appropriate preventive hygiene measures. Give guidance for recognising UTI symptoms (fever of unknown origin and urinary symptoms), and the need to seek medical advice if they appear.

D - It is recommended to give instructions on the collection of the urine sample and its preservation until the time of the test.

Q - It is recommended to inform about the prognosis, especially the risk of kidney damage and about the reasons for clinical monitoring and/or long-term treatment when required.

Q - It is recommended to inform about the scans to be performed, the reasons for them and what they consist of.

Monitoring Children with Permanent Kidney Damage after UTI

Key Question

- What monitoring is required for children with permanent renal damage after UTI?

GCP - It is recommended to determine blood pressure (BP), plasma creatinine (PCr), glomerular filtration rate, proteinuria, microalbuminuria, alpha-1-microglobulin and maximum osmolality urine as markers of kidney damage and/or indicators of progression.

GCP - In children with permanent, bilateral and severe (Goldraich type 3–4) kidney damage, it is recommended to test with a dipstick and determine the BP every 6 months, or annually for children with unilateral or mild affectation (Goldraich type 1–2).

GCP - Follow the centre protocol for monitoring patients with impaired renal function. In case of impaired renal function it is recommended to follow the patient according to the centre protocol.

GCP - It is not recommended to routinely use ambulatory blood pressure monitoring (ABPM) in children with permanent kidney damage and no alteration in renal function, as its prognostic value is not clearly demonstrated.

GCP - Do not routinely use plasma renin levels as a prognostic marker for hypertension (HT) in children with permanent kidney damage.

GCP - Boys with permanent kidney damage require further monitoring of renal function and BP in adolescence.

GCP - Give pregnant adolescents with renal disease regular check-ups for the early detection of bacteriuria and foetal/maternal complications (e.g., BP abnormalities, impaired renal function, intra-uterine growth retardation, foetal loss or premature birth).

UTI and Catheterisation in Children

Antibiotic Prophylaxis in Catheterised Children

Antibiotic Prophylaxis in Children with Indwelling Catheters

Key Question

- Is the use of prophylactic antibiotics effective in preventing a new UTI and renal damage in asymptomatic children with an indwelling catheter?

GCP - It is recommended to use prophylactic antibiotics to prevent UTI in children with a temporary urinary catheter after hypospadias repair urethral surgery.

GCP - It is recommended to use prophylactic antibiotics to prevent UTI in children with a temporary urinary catheter after vesicourethral surgery.

GCP - It is not recommended to use antibiotic prophylaxis in children with a temporary urinary catheter for non-surgical reasons.

Antibiotic Prophylaxis in Children under Intermittent Catheterisation

Key Question

- Is prophylactic treatment recommended for children requiring clean intermittent catheterisation for voiding problems?

GCP - It is not recommended to use antibiotic prophylaxis in paediatric patients under a clean intermittent catheterisation regimen.

Antibiotic Prophylaxis in Children Catheterised for Single Sampling or Endoscopic Procedures

Key Question

- Is the use of antibiotic prophylaxis recommended in children undergoing catheterisation for single sampling (VCUG, echocystography with contrast [CEUS], isotope VCUG, urine collection) or endoscopic procedures (cystoscopy, ureteroscopy, nephrostomy)?

GCP - It is not recommended to give routine antibiotic prophylaxis to children prior to diagnostic procedures requiring a single catheterisation (cystoscopy, VCUG, CEUS, urodynamics, urine sampling).

GCP - Antibiotic prophylaxis may be considered when there is a risk from related illnesses (e.g., heart disease), recurrent UTI, atypical UTI, suspected VUR grade IV–V or abnormalities.

Catheter Care

Short-term Catheterisation

Key Questions

- What is the best material or type of catheter to reduce UTI associated with short-term catheterisation?
- Does the size of the indwelling catheter affect the risk of catheter-associated urinary tract infection (CAUTI)?
- Does cleaning the urethral meatus prior to inserting the catheter reduce the incidence of CAUTI?
- Does routine care of the urethral meatus in patients under indwelling catheterisation reduce the incidence of CAUTI?

GCP - It is recommended to use silicone catheters.

D - It is recommended to take into account the clinical experience of the team, individual patient assessment and anticipated catheterisation duration when choosing the catheter.

D - It is recommended to choose the catheter diameter size based on an individual patient assessment and taking into account features such as age, urethral size, as well as the propensity for blocking the catheter.

D - When in hospitals, it is recommended to insert the catheter with sterile equipment using the aseptic technique.

D - It is recommended to clean the meatus with sterile saline or sterile water before inserting the urethral catheter.

D - It is recommended to use a single-use sterile lubricant to reduce the pain, urethral trauma and risk of infection.

A - Daily personal hygiene with soap and water is all that is needed for the proper care and cleaning of the urethral meatus after inserting the catheter.

D - It is recommended that health professionals inserting the catheter have training and experience in the insertion and maintenance of urethral

catheterisation.

Intermittent Catheterisation

Key Questions

- What type of catheter (coated or uncoated) is more appropriate for reducing UTI associated with intermittent catheterisation?
- What is the most appropriate size catheter for reducing UTI associated with intermittent catheterisation?
- What is the most appropriate insertion technique for intermittent catheterisation?

GCP - It is recommended that patients requiring intermittent catheterisation try different types of catheter, become familiar with their use and choose one or the other according to their perceived comfort and handling.

GCP - It is recommended to use the most appropriate catheter diameter according to the patient age taking into account the patient urethra size.

GCP - Outpatients who have to perform intermittent catheterisation for bladder emptying should use a clean technique.

GCP - Patients requiring intermittent catheterisation should be instructed in how to do it themselves at the earliest possible age.

GCP - It is recommended to assess hospitalised or institutionalised patients individually before deciding on the intermittent catheterisation technique to use.

Single Sampling Catheterisation

Key Questions

- Does the catheter material used in single sampling catheterisation affect the risk of CAUTI?
- Does the catheter size for single sampling catheterisation affect the risk of CAUTI?
- Does cleaning the urethral meatus prior to single sampling catheterisation reduce the incidence of CAUTI?

GCP - For single sampling catheterisation, use the catheter material with which the health professional is most familiar, avoiding exposure of the health professional and the patient to latex.

GCP - For single sampling catheterisation, choose the catheter size according to the age of the patient. It is recommended to insert the catheter until urine flows freely and avoid inserting an excessive length of catheter tube into the bladder.

GCP - It is recommended to use an aseptic technique with sterile media when performing single sampling catheterisation.

Definitions:

Levels of Evidence for Intervention Studies

1++	High quality meta-analyses, systematic reviews of clinical trials or high-quality clinical trials with very low risk of bias
1+	Well-conducted meta-analyses, systematic reviews of clinical trials, or well-conducted clinical trials with little risk of bias
1-	Meta-analyses, systematic reviews of clinical trials or clinical trials with high risk of bias
2++	High-quality systematic reviews of cohort or case-control studies. Cohort or case-control studies with very low risk of bias and with high probability of establishing a causal relationship
2+	Well-conducted cohort or case-control studies with low risk of bias and a moderate probability of establishing a causal relationship
2-	Cohort or case-control studies with a high risk of bias and a significant risk that the relationship is not causal
3	Non-analytical studies such as case reports and case series
4	Expert opinion

Note: Studies classified as 1- and 2- must not be used in the process of developing recommendations due to their high potential for bias.

Levels of Evidence for Questions about Diagnosis

Ia	Systematic review with homogeneity of level 1 studies
Ib	Level 1 studies
II	Level 2 studies Systematic review of level 2 studies
III	Level 3 studies Systematic review of level 3 studies
IV	Consensus, expert opinion without explicit critical evaluation.
Level 1 Studies	Comply with: • Masked comparison with a valid reference test (gold standard) • Adequate spectrum of patients
Level 2 Studies	Have only one of these biases: • Population not representative (the sample does not reflect the population where the test applies) • Inadequate comparison with the reference standard (gold standard), the test that will be evaluated is part of the gold standard, or the test result affects the implementation of the gold standard • Comparison not masked • Case-control studies
Level 3 Studies	Have two or more of the criteria described in level 2 studies

Grades of Recommendation for Intervention Studies

A	At least one meta-analysis, systematic review or clinical trial rated as 1++ directly applicable to the target population of the guide; or a body of evidence consisting of studies rated as 1+ and showing overall consistency of results.
B	A body of evidence consisting of studies rated as 2++, directly applicable to the target population of the guide and showing overall consistency of results; or evidence extrapolated from studies rated as 1++ or 1 +.
C	A body of evidence consisting of studies rated as 2+ directly applicable to the target population of the guide and showing overall consistency of results; or evidence extrapolated from studies rated as 2++.
D	Evidence level 3 or 4; or evidence extrapolated from studies rated as 2+.
Q	Evidence taken from relevant, good quality qualitative studies. This category is not included in the Scottish Collegiate Guidelines Network (SIGN).
Good Clinical Practice (GCP)*	Recommended practice based on clinical experience and the consensus of the editorial team.

*Sometimes the development group wishes to highlight an important practical aspect for which there is probably no supporting evidence. In general, these cases are related to an aspect of treatment generally accepted to be good clinical practice, and is evaluated as a point of good clinical practice. These messages are not an alternative to the recommendations based on evidence, but should be considered only when there is no other way of highlighting that aspect.

Grades of Recommendation for Questions about Diagnosis

Recommendation	Evidence
A	Ia or Ib

Recommendation	Evidence
B	II
C	III
D	IV

Clinical Algorithm(s)

The following clinical algorithms are included in the original guideline document:

- Urinary tract infection (UTI) diagnosis
- Diagnosis by imaging tests of urinary tract abnormalities and follow-up after UTI
- Antibiotic prophylaxis for urinary tract abnormalities after UTI
- Empirical treatment of UTI
- Follow-up after renal scarring

Scope

Disease/Condition(s)

Urinary tract infection

Guideline Category

Diagnosis

Management

Prevention

Risk Assessment

Treatment

Clinical Specialty

Emergency Medicine

Family Practice

Infectious Diseases

Nephrology

Pathology

Pediatrics

Radiology

Urology

Intended Users

Advanced Practice Nurses

Allied Health Personnel

Clinical Laboratory Personnel

Health Care Providers

Hospitals

Nurses

Patients

Physician Assistants

Physicians

Public Health Departments

Guideline Objective(s)

- To reduce the variability of clinical practice in the management of urinary tract infection (UTI) in the paediatric population, by encouraging professionals to diagnose and therapeutically intervene in the most appropriate way possible
- To be used as a tool to improve clinical management of children with UTI
- To provide relevant, standardised information to decrease the variability in care that exists today
- To provide relevant information to families and carers, to facilitate the diagnosis and monitoring of patients

Target Population

- Children from one month to 18 years old with suspected urinary tract infection (UTI)
- Paediatric patients requiring catheterisation in the following situations: investigations and therapeutic-type catheterisation (both intermittent and indwelling catheterisation)

Note: The guideline does not cover clinical issues concerning immuno-compromised paediatric patients; paediatric patients in intensive care units or other special care units, such as burns units, or those with virus, fungal or parasitic infections.

Interventions and Practices Considered

Diagnosis/Risk Assessment/Evaluation

1. Protective and risk factors for urinary tract infection (UTI): hygiene, pinworms, breastfeeding, circumcision, phimosis
2. Clinical diagnosis of UTI with laboratory confirmation
3. Biological diagnosis of UTI
    - Urine collection methods (e.g., midstream clean catch, catheterisation, perineal bag, suprapubic aspiration [SPA] with ultrasound)
    - Preserving and transporting urine samples
    - Urine tests for diagnosing UTI (e.g., Gram-stain microscopic examination, urine culture, dipstick test)
4. Localisation of UTI through clinical or laboratory findings (e.g., fever, high acute phase reactants C-reactive protein [CRP] and/or procalcitonin [PCT], interleukin-6 [IL-6])
5. Diagnostic imaging
    - Urinary tract ultrasound
    - Renal scintigraphy with technetium-labelled dimercaptosuccinic acid (99mTc-m) (DMSA)
    - Cystography (voiding cystourethrogram [VCUG], radionuclide cystography or echo-enhanced cystography)
6. Predicting risk of chronic kidney damage
7. Hospitalisation and referral criteria

Treatment/Management/Prevention

1. Treatment of acute phase of UTI

    - Starting early empirical treatment
    - Empirical therapy administration route (intravenous, oral)
    - Choice of empirical antibiotic therapy
    - Aminoglycoside and single daily dose administration
    - Duration of antibiotic treatment
    - Treatment of acute focal nephritis and renal abscess
2. Prophylaxis for UTI
    - Antibiotic prophylaxis in children with no structural or functional urinary tract abnormalities
    - Choice of antibiotic and chemoprophylactic dose
    - Antibiotic prophylaxis in children with structural and/or functional urinary tract abnormalities
3. Lifestyle measures for preventing UTI (voiding habits, fluid intake, preventing constipation)
4. Monitoring for risk of recurrent UTI
5. Providing information for families or carers to help in the diagnosis of UTI
6. Monitoring children with permanent renal damage after UTI
7. Antibiotic prophylaxis in children with indwelling catheters
8. Catheter care

Major Outcomes Considered

- Rate of complications of recurrent infection, including progressive renal scarring
- Time to improvement
- Change in quality of life for patient and family
- Sensitivity and specificity of diagnostic methods
- Effectiveness of antimicrobial therapy

Methodology

Methods Used to Collect/Select the Evidence

Hand-searches of Published Literature (Primary Sources)

Hand-searches of Published Literature (Secondary Sources)

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

Clinical questions were prepared and selected at successive meetings by brainstorming and subsequent prioritisation by the Guideline Development Group (GDG), concluding with the questions contained in the original guideline document related to epidemiology, diagnosis, treatment, prevention, monitoring urinary tract infection (UTI) in children and catheter care in children. The clinical questions were prepared using the PICO format (Patient/Intervention/Comparison/Outcome).

After the questions were prepared, a literature search of databases and other specialist sources (Medline, EMBASE, Clinical Excellence, Trip Database, GuíaSalud, National Guideline Clearinghouse, Guidelines International Network [GIN]) was begun to find other national or international clinical practice guidelines (CPGs) on a similar theme. This resulted in 12 guides being found, of which 5 were discarded, as the people, topics, interventions, date of issue or methodology did not meet the objectives and scope of this CPG. The 7 remaining guidelines were evaluated using the Appraisal of Guidelines Research & Evaluation (AGREE) instrument by 4 independent reviewers.

The individual scores for these guides are available in Annex 1 (Table 13 in the original guideline document). It was agreed that only those guidelines that obtained scores above 85% for rigour of preparation would be considered suitable as a source of evidence in this guide. There were 5 eligible, of which 3 focused exclusively on care of the catheterised patient and catheter care.

These 5 guides became secondary sources of evidence for answering different clinical questions, and this is indicated in the different sections of the

original guideline document where findings or studies from them are referenced. The methodology proposed by Servicio de Evaluacíon de Tecnologías Sanitarías (OSTEBA) in the Asthma CPG Methodology Description Evaluation report was followed to modify and update the evidence from these guidelines.

For clinical questions addressed in the original guideline document which were included in the National Institute for Health and Clinical Excellence (NICE) CPG, the searches from 2006 were updated to June 2010 by modifying those used by NICE. For the rest of the questions, new specific search strategies were developed: limiting them to the previous 10 years, except in exceptional cases where no appropriate studies were found, when they were not limited by date.

The search strategies combined terms in controlled language in each database (Medical Subject Heading [MeSH], Emtree, Decs) and free terms to improve and balance their sensitivity and specificity. The sources were Medline (PubMed), EMBASE (Elsevier.com), CRD Databases, Cochrane Library, Information Behavior in Everyday Contexts (IBEC) and Literatura Latino Americana em Ciências da Saúde (LILAC). For the questions relating to catheters included in Chapter 18 of the original guideline document, the Cumulative Index to Nursing & Allied Health (CINAHL) database was also consulted. For questions regarding treatment, the clinical trials registry ClinicalTrials.gov was used.

Searches were tailored to the types of studies best suited to the question in Spanish, French, English and Portuguese.

An inverse search was made in those referenced articles, included and excluded, which were identified. No systematic search was made of grey literature, although in some cases congress summaries were included in the volume of evidence due to its relevance, and given the absence of other studies.

The detailed information with the methodological process of the CPG (search strategies for each clinical question, critical reading sheets for the selected studies, tables summarising the evidence and formal evaluation) are available at www.guiasalud.es (see also the "Availability of Companion Documents" field).

Number of Source Documents

Not stated

Methods Used to Assess the Quality and Strength of the Evidence

Expert Consensus

Weighting According to a Rating Scheme (Scheme Given)

Rating Scheme for the Strength of the Evidence

Levels of Evidence for Intervention Studies

1++	High quality meta-analyses, systematic reviews of clinical trials or high-quality clinical trials with very low risk of bias
1+	Well-conducted meta-analyses, systematic reviews of clinical trials, or well-conducted clinical trials with little risk of bias
1-	Meta-analyses, systematic reviews of clinical trials or clinical trials with high risk of bias
2++	High-quality systematic reviews of cohort or case-control studies. Cohort or case-control studies with very low risk of bias and with high probability of establishing a causal relationship
2+	Well-conducted cohort or case-control studies with low risk of bias and a moderate probability of establishing a causal relationship
2-	Cohort or case-control studies with a high risk of bias and a significant risk that the relationship is not causal
3	Non-analytical studies such as case reports and case series
4	Expert opinion

Note: Studies classified as 1- and 2- must not be used in the process of developing recommendations due to their high potential for bias.

Levels of Evidence for Questions about Diagnosis

Ia	Systematic review with homogeneity of level 1 studies
Ib	Level 1 studies
II	Level 2 studies Systematic review of level 2 studies
III	Level 3 studies Systematic review of level 3 studies
IV	Consensus, expert opinion without explicit critical evaluation.
Level 1 Studies	Comply with: • Masked comparison with a valid reference test (gold standard) • Adequate spectrum of patients
Level 2 Studies	Have only one of these biases: • Population not representative (the sample does not reflect the population where the test applies) • Inadequate comparison with the reference standard (gold standard), the test that will be evaluated is part of the gold standard, or the test result affects the implementation of the gold standard • Comparison not masked • Case-control studies
Level 3 Studies	Have two or more of the criteria described in level 2 studies

Methods Used to Analyze the Evidence

Review of Published Meta-Analyses

Systematic Review with Evidence Tables

Description of the Methods Used to Analyze the Evidence

The search results were initially screened by title and abstract. The selected studies were then subjected to a second screening by clinicians responsible for reading them. Those studies considered useful for answering the questions in this guide were evaluated and classified according to the levels of evidence proposed by the Scottish Intercollegiate Guidelines Network (SIGN) for intervention studies, and according to the adaptation of levels of evidence from the Centre for Evidence-Based Medicine in Oxford, proposed by National Institute for Health and Clinical Excellence (NICE) for diagnostic test studies (see the "Rating Scheme for the Strength of the Evidence" field).

The detailed information with the methodological process of the clinical practice guideline (search strategies for each clinical question, critical reading sheets for the selected studies, tables summarising the evidence and formal evaluation) are available at www.guiasalud.es (see also the "Availability of Companion Documents" field).

Methods Used to Formulate the Recommendations

Expert Consensus

Description of Methods Used to Formulate the Recommendations

The methodology used in developing this clinical practice guideline (CPG) comes from the 'Manual for CPG Development in the National Health

Service (SNS)'.

The steps followed for the preparation of this guide started with the constitution of the guideline development group (GDG), composed of 15 clinical professionals from different health care settings, primary care and hospital care, as well as various specialties: nursing, paediatrics, paediatric surgery and paediatric nephrology. The GDG did not include patients or relatives, and it requested 3 potential users of information for patients (parents of young children) to review its contents.

After critical appraisal of the evidence, recommendations were made according to formal assessment or reasoned judgment. In addition to the volume and quality of evidence, the GDG had to consider the applicability of the results, their consistency and their relevance in the National Health System or their clinical impact. For those clinical questions where the evidence was scarce, of low methodological quality (levels of evidence 1- and 2-) or inconsistent, recommendations were established based on group consensus.

Rating Scheme for the Strength of the Recommendations

Grades of Recommendation for Intervention Studies

A	At least one meta-analysis, systematic review or clinical trial rated as 1++ directly applicable to the target population of the guide; or a body of evidence consisting of studies rated as 1+ and showing overall consistency of results.
B	A body of evidence consisting of studies rated as 2++, directly applicable to the target population of the guide and showing overall consistency of results; or evidence extrapolated from studies rated as 1++ or 1 +.
C	A body of evidence consisting of studies rated as 2+ directly applicable to the target population of the guide and showing overall consistency of results; or evidence extrapolated from studies rated as 2++.
D	Evidence level 3 or 4; or evidence extrapolated from studies rated as 2+.
Q	Evidence taken from relevant, good quality qualitative studies. This category is not included in the Scottish Collegiate Guidelines Network (SIGN).
Good Clinical Practice (GCP)*	Recommended practice based on clinical experience and the consensus of the editorial team.

*Sometimes the development group wishes to highlight an important practical aspect for which there is probably no supporting evidence. In general, these cases are related to an aspect of treatment generally accepted to be good clinical practice, and is evaluated as a point of good clinical practice. These messages are not an alternative to the recommendations based on evidence, but should be considered only when there is no other way of highlighting that aspect.

Grades of Recommendation for Questions about Diagnosis

Recommendation	Evidence
A	Ia or Ib
B	II
C	III
D	IV

Cost Analysis

The guideline developers reviewed a published cost analysis.

Method of Guideline Validation

External Peer Review

Internal Peer Review

Description of Method of Guideline Validation

After preparing a first draft, the text was submitted to a peer review process in 2 parts: the first focused solely on the recommendations and Patient/Intervention/Comparison/Outcome (PICO) questions, carried out by expert contributors, and the second by external reviewers. The expert contributors and peer reviewers were in most cases proposed as expert members by their respective scientific societies. The societies involved in preparing this guide, and also those represented by members of the development group, expert contributors and peer reviewers, were the Spanish Association of Paediatric Nephrology, the Spanish Association of Paediatrics, the Spanish Association of Paediatric Primary Care, the Spanish Society of Paediatric Surgery, the Spanish Society of Infectious Diseases and Clinical Microbiology, the Spanish Society of Paediatric Radiology and the Spanish Society of Paediatric Emergency.

Evidence Supporting the Recommendations

Type of Evidence Supporting the Recommendations

The type of supporting evidence is specifically stated for each recommendation (see the "Major Recommendations" field).

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits

Accurate diagnosis and appropriate treatment of urinary tract infection (UTI) in children

Potential Harms

- When assessing the adequacy of a urine collection technique, both its diagnostic validity and the cost of any diagnostic errors incurred must be considered. Undiagnosed urinary tract infection (UTI) will result in a therapeutic delay and a possible increased risk of kidney damage; whereas, UTI misdiagnosed due to urine contamination can initiate a series of inappropriate diagnostic and therapeutic procedures.
- Cystography involves inserting a catheter into the bladder and injecting a substance that acts as a contrast. The risks of the test are associated with the catheter, its inconvenience and the radiation involved if done by radiology or isotope.
- Intravenous urography involves injecting a contrast containing iodine through a vein to obtain a photographic image and anatomical details of the kidney and urinary tract. There are radiation hazards and the possibility of an allergic reaction to the injected contrast dye.
- Treatment with antibiotics poses risks to the patient, such as allergic reactions to medications, gastrointestinal and other side effects, and increased bacterial resistance.
- The urinary catheter is a procedure performed frequently and is usually safe, however, there are special risks in children, which are greater still in younger children. The use of suitable catheters, an understanding of the lower urinary tract anatomy and knowledge of how far to insert a urinary catheter are essential to reduce complications associated with their use. Reported complications with catheter use include patient discomfort, urethral trauma, and catheter-associated UTI (CAUTI).

Qualifying Statements

Qualifying Statements

This clinical practice guidelines (CPG) is an aid to decision making in health care. It is not mandatory nor does it replace the clinical judgment of medical personnel.

Implementation of the Guideline

Description of Implementation Strategy

The clinical practice guideline (CPG) is a tool to help professionals and users make decisions about the most appropriate healthcare. Therefore, the recommendations in this guide need to be introduced and implemented in those healthcare environment sectors relevant for their application, and to that end the following are recommended:

- Health authorities should present the CPG to the media.
- The CPG should be presented to the various national paediatric, paediatric nephrology and paediatric urology associations and societies.
- Presentation of the CPG to the relevant regional associations.
- Distribution of the abbreviated form to various institutions and organisations in the healthcare environment.
- Collaboration with the scientific societies who participated in the CPG review to promote its dissemination.
- Provision and distribution of the CPG to different CPG database compilers for its evaluation and inclusion in them.
- Free access to different versions of the CPG on the GuíaSalud Web site http://www.guíasalud.es .
- Dissemination and information about the CPG in scientific activities related to paediatrics, urology, nephrology and nursing.
- Translation of the complete version into English.

Implementation Tools

Clinical Algorithm

Foreign Language Translations

Mobile Device Resources

Patient Resources

Quick Reference Guides/Physician Guides

For information about availability, see the *Availability of Companion Documents* and *Patient Resources* fields below.

Institute of Medicine (IOM) National Healthcare Quality Report Categories

IOM Care Need

Getting Better

Staying Healthy

IOM Domain

Effectiveness

Patient-centeredness

Identifying Information and Availability

Bibliographic Source(s)

Working Group of the Clinical Practice Guidelines for Urinary Tract Infection in Children. Clinical practice guideline for urinary tract infection in children. Madrid (Spain): Ministry of Health National Health Service Quality Plan, Social and Equality Policy, Aragon Health Sciences Institute (I+CS); 2011. 259 p. (SNS Clinical Practice Guidelines: I+CS; no. 2009/01). [372 references]

Adaptation

Not applicable: The guideline was not adapted from another source.

Date Released

2011

Guideline Developer(s)

Aragon Institute for Health Sciences - State/Local Government Agency [Non-U.S.]

GuiaSalud - National Government Agency [Non-U.S.]

Ministry of Health (Spain) - National Government Agency [Non-U.S.]

Guideline Developer Comment

Collaborating societies:

- Spanish Association of Paediatric Nephrology
- Spanish Association of Paediatrics
- Spanish Association of Paediatrics for Primary Health Care
- Spanish Association for Paediatric Surgery
- Spanish Association for Infectious Diseases and Clinical Microbiology
- Spanish Association for Paediatric Radiology
- Spanish Association for Paediatric Emergency

Members of these societies have participated as authors, expert collaborators, or external reviewers of the clinical practice guideline (CPG).

Source(s) of Funding

This clinical practice guidelines (CPG) was financed by the agreement signed by the Carlos III Health Institute, an autonomous body of the Ministry of Science and Research, and the Aragon Institute of Health Sciences within the framework of cooperation envisaged in the Ministry of Health National Health System Quality Plan, Social and Equality Policy.

Guideline Committee

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Financial Disclosures/Conflicts of Interest

All members of the Development Group, as well as those who participated in the expert collaboration and external review, made the declaration of interest appearing in Annex 6 in the original guideline document.

Guideline Status

This is the current release of the guideline.

Guideline Availability

Electronic copies: Available in English and Spanish from the GuíaSalud Web site.

Availability of Companion Documents

The following are available:

- Quick reference guides and summary versions are available from the GuíaSalud Web site.
- Guideline methodology is available in Spanish in Portable Document Format (PDF) from the GuíaSalud Web site.
- Updating clinical practice guidelines in the Spanish National Healthcare System: methodology handbook. Available from the GuíaSalud Web site.
- The Spanish version of the guideline is also available via a mobile application from the GuíaSalud Web site.

Patient Resources

Patient information can be found in the appendices of the original guideline document. A Spanish version is also available from the GuíaSalud Web site.

Please note: This patient information is intended to provide health professionals with information to share with their patients to help them better understand their health and their diagnosed disorders. By providing access to this patient information, it is not the intention of NGC to provide specific medical advice for particular patients. Rather we urge patients and their representatives to review this material and then to consult with a licensed health professional for evaluation of treatment options suitable for them as well as for diagnosis and answers to their personal medical questions. This patient information has been derived and prepared from a guideline for health care professionals included on NGC by the authors or publishers of that original guideline. The patient information is not reviewed by NGC to establish whether or not it accurately reflects the original guideline's content.

NGC Status

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